Honeywell Docket No.: H0005333-1160
BSKB Docket No.: 2929-0251P

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Mark L. LA FOREST, et al.

Application No.: 10/783,548 | Confirmation No.: 7427

Filed: February 20, 2004 | Art Unit: 1732

For: VERSATILE MOLD FLOW CAPABILITY IN THE INFILTRATION OF POROUS CARBON PREFORMS WITH PITCH/THERMOPLASTIC/THERMOSET RESINS | Examiner: WOLLSCHLAGER

BRIEF ON APPEAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

(i) Real party in interest

The real party in interest in this appeal is Honeywell International Inc., the assignee of the subject application.

(ii) Related appeals and Interferences

There are no related appeals or Interferences.

(iii) Status of claims

Claims 1-14 and 16-19 are pending in the application. Claims 1-6 are withdrawn from consideration. Claims 7-14 and 16-19 stand rejected. This appeal is from the rejection of claims 7-14 and 16-19.

(iv) Status of Amendments

No Amendments were filed subsequent to the date of the Final Rejection.

(v) Summary of claimed subject matter

Claims 7 and 19 are the sole independent claims involved in this appeal.

Claim 7 is drawn to a rapid resin (or pitch) transfer molding process for the manufacture of carbon-carbon composites. Specification, page 1, lines 5-6. The process of this invention requires several sequential steps, as follows.

In practicing the present invention, one first arranges a porous preform (11, 18, 57), at a temperature above a melting point of a resin or pitch to be transferred into the preform, in an annular mold cavity (1, 35). Specification, page 3, line 29 – page 4, line 1. The annular mold cavity is defined by a top half that includes an annular groove (87) and a bottom half that includes an annular groove (85) opposed to the top half annular groove. Specification, page 4, lines 2-5. Plural melt supply channels (5, 6, 7, 8, 9, 86) are disposed in the top half and in the bottom half of the mold to operatively communicate with the annular mold cavity. Specification, page 4, lines 5-8. Valves (13, 36) are operated to admit resin or pitch into the melt supply channels in the top half and the bottom half of the mold. Specification, page 4, lines 8-10. The annular mold cavity is provided with an arrangement (22, 25, 81) for venting and/or providing a vacuum to the mold cavity. Specification, page 4, lines 10-11.

Once the preform is arranged in the annular mold cavity, one effects flow of the resin or pitch from the channels located in the top and bottom of the mold cavity through the body of the preform located in the mold cavity to vents (22, 25, 81) located in the center of, at the top and/or bottom of, and/or annularly around the mold cavity. Specification, page 4, lines 12-17.

Then one cools the resulting resin-infiltrated (or pitch-infiltrated) preform to below the melting point of the resin (or pitch) and removes it from the mold. Specification, page 4, lines 19-22.

Claim 19 is drawn to a preferred embodiment of the process of claim 7. In claim 19, cooling of the resin-infiltrated (or pitch-infiltrated) preform is specified to be effected by a flash cooling system. Specification, page 4, line 20.

(vi) Grounds of rejection to be reviewed on appeal

The following grounds of rejection are to be reviewed on appeal:

The rejection of claims 7-14 and 16-18 under 35 U.S.C. § 103(a) as being unpatentable over US 6,537,470 B1 or WO 02/18120 A2 (collectively, "Wood") in view of US 5,045,251 ("Johnson").

The rejection of claim 19 under 35 U.S.C. § 103(a) as being unpatentable over Wood view of Johnson and US 6,030,575 ("Barron") or US 5,567,509 ("Gautier").

The rejection of claims 7-14 and 16-18 on the ground of obviousness-type double patenting over claims 1-20 of US 6,537,470 B1 ("Wood-U.S.") in view of Johnson.

The rejection of claim 19 on the ground obviousness-type double patenting over claims 1-20 of Wood-U.S. in view of Johnson, Barron, and Gautier.

The rejection of claims 7-14 and 16-18 on the ground of obviousness-type double patenting over claims 5-17 of US 7,025,913 B2 ("La Forest").

The rejection of claim 19 on the ground obviousness-type double patenting over claims 5-17 of La Forest in view of Barron and Gautier.

(vii) Argument

Rejection of claims 7-14 and 16-18 over Wood in view of Johnson.

The Examiner acknowledged on page 7 of the Final Rejection that Wood fails to teach or suggest "a plurality of melt channels in the top and bottom half". This is a reference to the requirement in Appellants' ***process*** claims that a plurality of melt supply channels be disposed in the top half of the mold and a plurality of melt supply channels be disposed in the bottom half of the mold in order to operatively communicate with the annular mold cavity.

The Examiner argues that Johnson makes it obvious to modify the Wood process by providing a plurality of melt supply channels in the Wood mold in order to reduce the distance the rapidly curing resin needed to travel. Appellants do not simply provide a plurality of melt supply channels in the Wood mold. The precise language of the present claims is "a plurality of melt supply channels is disposed in the top half and [a plurality of melt supply channels is disposed] in the bottom half of the mold." This novel configuration provides a system with a significant processing versatility[1] that is not provided by the Wood technology.

The attached Evidence Appendix shows Appellants' and Wood's molds, and also shows the Johnson mold. It is apparent that the type of molding with which Johnson is concerned is completely different from the type of molding with which Wood and Appellants are concerned. The Examiner appears to recognize that the distances and resin flow channel links depicted in Johnson suggest nothing about the distances and resin flow in Wood or in the present invention. The Examiner expressly indicates on page 3 of the Advisory Action that "it is the teaching (in the Introduction section of the Johnson patent) that multiple ports are desirable to reduce the distance of travel of the rapidly curing resin" that is being combined with the Wood disclosure. The Examiner refers on page 2 of the Advisory Action to lines 53-60 in column 1 of Johnson, which state that "for longer flow distances multiple inlet ports may be required."

Inspection of the Johnson drawing shows that each branch of the Johnson mold has a single resin inlet port, and that all of the resin channels in Johnson have one end which is in close

[1] For instance, the present process can be run as top fill only, bottom fill only, or top and bottom fill simultaneously, or can be used for outside diameter to inside diameter infiltration or inside diameter to outside diameter filtration, etc. More details of the versatility provided by the present technology may be found in paragraph [0021] of the

proximity to all of the other resin channels. In the Wood mold, central nozzle 26 (reference character 16 in Appellants' Figure 5B), is analogous to port area 13 in the Johnson mold – that is, the point at which all the resin channels are in close proximity. The Examiner has failed to explain how the vague generic disclosure in Johnson makes it obvious to modify, for instance, the mold of Wood's Figure 4 to include ***multiple bottom*** inlet ports 41 and ***multiple top*** inlet ports 43 – which are all ***remotely located*** from central nozzle (16, 26), as shown in Appellants' Figure 5B.

It is respectfully submitted that the rejection of process claims 7-14 and 16-18 over Wood in view of Johnson as it is currently stated by the Examiner is not sustainable.

Rejection of claim 19 over Wood in view of Johnson, Barron, and Gautier.

With respect to Wood and Johnson, as discussed above, the Examiner has failed to explain how the vague generic disclosure in Johnson makes it obvious to modify, for instance, the mold of Wood's Figure 4 to provide for processing through ***multiple bottom*** inlet ports 41 and ***multiple top*** inlet ports 43. Neither Barron nor Gautier remedies the deficiencies of the Wood and Johnson references.

Moreover, claim 19 requires among other things "cooling the resulting resin-infiltrated or pitch-infiltrated preform to below the melting point of the resin or pitch by an air, water, or mist flash cooling system." The Examiner alleges at the top of page 10 of the Final Rejection that "a flash cooling system ... is disclosed by either of Gautier or Barron." What Gautier actually teaches is "Shaping then takes place ... within the shaping mould under a slight vacuum ... and a moderate temperature .... Vacuum cooling then takes place of the blank prior to its demoulding." Column 5, lines 4-14. How is this a teaching of "flash cooling"? Barron teaches that "The fibers of the preform are compacted by the force of the binder spray and also by the vacuum means .... As the heat source moves away from each given point on the preform, the binder quickly cools." Column 11, lines 57-65. How is this a teaching of "flash cooling"?

It is respectfully submitted that the rejection of claim 19 over the Wood disclosure in view of the Johnson disclosure and the Barron or Gautier disclosures as it is currently stated by

---

specification.

the Examiner is not sustainable under 35 U.S.C. § 103(a).

D.P. rejection of claims 7-14 and 16-18 over Wood-U.S. in view of Johnson.

Appellants' claims 7-14 and 16-18 require the use of a plurality of melt supply channels disposed in the top half of the mold and a plurality of melt supply channels disposed in the bottom half of the mold to operatively communicate with the annular mold cavity. The Examiner has not demonstrated that the presently claimed process differs from the process of claims 1-20 of Wood-U.S. by only obvious differences.

The Examiner argues that Johnson makes it obvious to modify the Wood technology by providing a plurality of melt supply channels therein "in order to reduce the distance the rapidly curing resin needed to travel." Final Rejection, page 7. It is apparent from the attached Evidence Appendix that the type of molding with which Johnson is concerned is significantly different from the type of molding with which Wood-U.S. and Appellants are concerned. The distances and resin flow channel links in Johnson suggest nothing about the distances and resin flow in the technology of the present invention and Wood-U.S. It is noted that in Johnson, the resin inlets are identified by reference numerals 21, 32, 42, and 51. The Examiner has failed to explain how that disclosure in Johnson makes it obvious to modify, for instance, the mold of Wood's Figure 4 to include – in addition to nozzle 26 – multiple ***top*** and ***bottom*** inlet ports 41 and 43 as shown in Appellants' Figure 5B and as required by the present claims.

It is respectfully submitted that the obviousness-type double patenting rejection of claims 7-14 and 16-18 over claims 1-20 of Wood-U.S. in view of Johnson as it is currently stated by the Examiner is not sustainable.

D.P. rejection of claim 19 over Wood-U.S. in view of Johnson, Barron, and Gautier.

Appellants' claim 19 employs a plurality of melt supply channels disposed in the top half of the mold and a plurality of melt supply channels disposed in the bottom half of the mold to operatively communicate with the annular mold cavity. The Examiner has not demonstrated that the presently claimed process differs from that of claims 1-20 of Wood-U.S. by only obvious differences.

The attached Evidence Appendix also shows the Johnson technology. It is apparent that

the type of molding with which Johnson is concerned is significantly different from the type of molding with which Wood and Appellants are concerned. The distances and resin flow channel links in Johnson suggest nothing about the distances and resin flow in the present invention. It is noted that in Johnson, the resin inlets are identified by reference numerals 21, 32, 42, and 51. The Examiner has failed to explain how that disclosure in Johnson makes it obvious to modify, for instance, the mold of Wood's Figure 4 to include – in addition to nozzle 26 – inlet ports 41 and 43 as shown in Appellants' Figure 5B.

Claim 19 also requires a flash cooling step. The Examiner argues that "a flash cooling system ... is disclosed by either of Gautier or Barron." What Gautier teaches is "Shaping then takes place ... within the shaping mould under a slight vacuum ... and a moderate temperature .... Vacuum cooling then takes place of the blank prior to its demoulding." Column 5, lines 4-14. Barron teaches that "The fibers of the preform are compacted by the force of the binder spray and also by the vacuum means .... As the heat source moves away from each given point on the preform, the binder quickly cools." Column 11, lines 57-65. It is not clear how either of these disclosures is a teaching of "flash cooling."

It is respectfully submitted that the obviousness-type double patenting rejection of claim 19 herein over claims 1-20 of Wood-U.S. in view of Johnson as it is currently stated by the Examiner is not sustainable.

D.P. rejection of claims 7-14 and 16-18 over La Forest.

Appellants' claims 7-14 and 16-18 are drawn to a process that employs both a plurality of melt supply channels disposed in the top half of the mold and a plurality of melt supply channels disposed in the bottom half of the mold to operatively communicate with the annular mold cavity. The Examiner has not demonstrated – on pages 4-5 of the Final Rejection or elsewhere – that the presently claimed process differs from the process of claims 5-17 of La Forest by only obvious differences.

D.P. rejection of claim 19 over La Forest, Barron, and Gautier.

Appellants' claim 19 requires the use of a plurality of melt supply channels disposed in the top half of the mold and a plurality of melt supply channels disposed in the bottom half of the

mold to operatively communicate with the annular mold cavity. Claim 19 also requires flash cooling. The Examiner has nowhere demonstrated that the invention of claim 19 differs from the invention of any one of claims 5-17 of La Forest by only obvious differences.

Conclusion

The question under 35 U.S.C. § 103(a) is not whether the differences between the prior art and the invention in and of ***themselve***s would have been obvious, but whether the claimed invention ***as a whole*** would have been obvious[2]. The Supreme Court has held that "... a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art."[3] The Court pointed out that this is so because inventions in most, if not all, instances rely upon building blocks long since uncovered. Newly claimed discoveries almost of necessity will be combinations of what, in some sense, is already known. In the present situation -- in any event – the Examiner has not even demonstrated that each of the elements of the present claims (specifically, the plurality of melt supply channels in both a top half and a bottom half of a mold) were known in the prior art, independently or otherwise.

It is axiomatic, moreover, that every feature of the claims must be considered in deciding the question of obviousness. With respect to the main ancillary reference here, Johnson, at best it provides the general concept of providing multiple resin inlet ports to deal with longer flow distances. Johnson in no way teaches or suggests the employment in a process of "a ***plurality*** of melt supply channels ... disposed in the ***top half*** and [a ***plurality*** of melt supply channels disposed] in the ***bottom half*** of the [Woods] mold."

It goes without saying that Woods and Johnson together do not provide persons of ordinary skill in the art with "A rapid resin or pitch transfer molding process, comprising the steps of: arranging a porous preform, at a temperature above a melting point of a resin or pitch to be transferred into the preform, in an annular mold cavity defined by a top half that includes an annular groove and a bottom half that includes an annular groove opposed to the top half annular

[2] *Stratoflex, Inc. v. Aeroquip Corp.*, 218 USPQ 871 (Fed. Cir. 1983).

groove, so that the top half and the bottom half annular grooves together form said annular mold cavity, wherein a plurality of melt supply channels is disposed in the top half and in the bottom half of the mold to operatively communicate with said annular mold cavity, wherein valves are operated to admit resin or pitch into the melt supply channels in the top half and the bottom half of the mold, and wherein said annular mold cavity is provided with an arrangement for venting and/or providing a vacuum thereto; effecting flow of the resin or pitch from channels located in the top and bottom of the mold cavity through the body of the preform located in the mold cavity to vents located in the center of, at the top and/or bottom of, and/or annularly around the mold cavity, in order to effect impregnation of the preform; cooling the resulting resin-infiltrated or pitch-infiltrated preform to below the melting point of the resin or pitch; and removing the impregnated preform from the mold." Withdrawal of all rejections of record is in order and is earnestly solicited.

If there are any questions concerning this application, please contact Richard Gallagher (Reg. No. 28,781) at (703) 205-8008.

Dated: September 26, 2007

Respectfully submitted,

By R. Gallagher #28,781
for D. Richard Anderson
Registration No.: 40,439
BIRCH, STEWART, KOLASCH & BIRCH, LLP
8110 Gatehouse Rd
Suite 100 East
Falls Church, Virginia 22040-0747
(703) 205-8000
Attorney for Appellant

[3] *KSR International Co. v. Teleflex Inc.* 82 USPQ2d 1385 (U.S. 2007).

(viii) Claims Appendix:

7. A rapid resin or pitch transfer molding process, comprising the steps of:

arranging a porous preform, at a temperature above a melting point of a resin or pitch to be transferred into the preform, in an annular mold cavity defined by a top half that includes an annular groove and a bottom half that includes an annular groove opposed to the top half annular groove, so that the top half and the bottom half annular grooves together form said annular mold cavity, wherein a plurality of melt supply channels is disposed in the top half and in the bottom half of the mold to operatively communicate with said annular mold cavity, wherein valves are operated to admit resin or pitch into the melt supply channels in the top half and the bottom half of the mold, and wherein said annular mold cavity is provided with an arrangement for venting and/or providing a vacuum thereto;

effecting flow of the resin or pitch from channels located in the top and bottom of the mold cavity through the body of the preform located in the mold cavity to vents located in the center of, at the top and/or bottom of, and/or annularly around the mold cavity, in order to effect impregnation of the preform;

cooling the resulting resin-infiltrated or pitch-infiltrated preform to below the melting point of the resin or pitch; and

removing the impregnated preform from the mold.

8. The rapid resin or pitch transfer molding process according to claim 7, wherein the preform is selected from the group consisting of fibrous preforms, carbon fiber preforms, nonwoven preforms, random fiber preforms with binder, rigidized preforms, and foam preforms.

9. The rapid resin or pitch transfer molding process according to claim 8, wherein the preform is a porous carbon body.

10. The rapid resin or pitch transfer molding process of claim 9, wherein said preform is configured as a brake disc for an aircraft landing system.

11. The rapid resin or pitch transfer molding process according to claim 7, wherein the preform is heated to a temperature between about 100°C through about 425°C.

12. The rapid resin or pitch transfer molding process according to claim 7, wherein the mold is heated to a temperature between about 100°C through about 310°C.

13. The rapid resin or pitch transfer molding process according to claim 7, wherein the resin or pitch is a member selected from the group consisting of synthetic pitch, coal tar pitch, petroleum pitch, mesophase pitch, high char yield thermoset resin, and combinations thereof.

14. The rapid resin or pitch transfer molding process according to claim 7, in which multiple preforms are placed in a single mold.

16. The rapid resin or pitch transfer molding process according to claim 15[4], which further comprises heating to a temperature of from about 1600°C through about 2800°C to graphitize the carbonized impregnated preform.

17. The rapid resin or pitch transfer molding process according to claim 16, wherein the graphitized preform is further densified using chemical vapor deposition/ chemical vapor infiltration or resin transfer molding.

18. The rapid resin or pitch transfer molding process according to claim 7, wherein a vacuum is provided to the mold prior to injecting the molten resin or pitch.

19. A rapid resin or pitch transfer molding process, comprising the steps of:

arranging a porous preform, at a temperature above a melting point of a resin or pitch to

[4] Inasmuch as claim 15 has been cancelled, claim 16 should depend from claim 7.

be transferred into the preform, in an annular mold cavity defined by a top half that includes an annular groove and a bottom half that includes an annular groove opposed to the top half annular groove, so that the top half and the bottom half annular grooves together form said annular mold cavity , wherein a plurality of melt supply channels is disposed in the top half and in the bottom half of the mold to operatively communicate with said annular mold cavity, wherein valves are operated to admit resin or pitch into the melt supply channels in the top half and the bottom half of the mold, and wherein said annular mold cavity is provided with an arrangement for venting and/or providing a vacuum thereto;

effecting flow of the resin or pitch from channels located in the top and bottom of the mold cavity through the body of the preform located in the mold cavity to vents located in the center of, at the top and/or bottom of, and/or annularly around the mold cavity, in order to effect impregnation of the preform;

cooling the resulting resin-infiltrated or pitch-infiltrated preform to below the melting point of the resin or pitch by an air, water, or mist flash cooling system; and

removing the impregnated preform from the mold.

(ix) Evidence[5] Appendix (page 1 of 2):

Figure 4 of US 6,537,470 B1 (Wood)

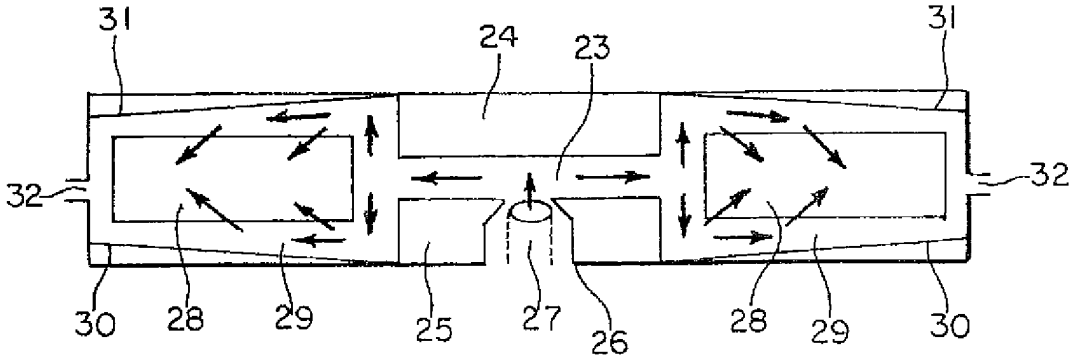


FIG. 4

Figure 5B of Serial No. 10/785,548 (this application)

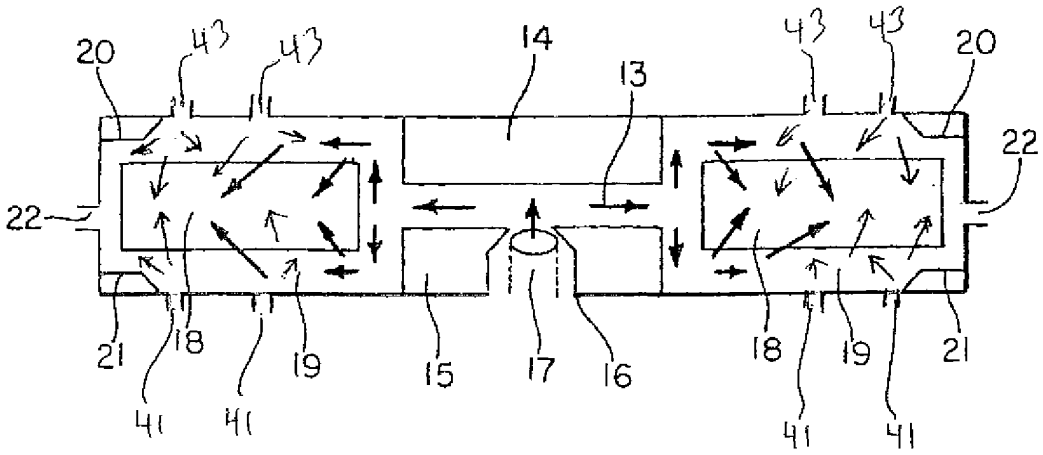
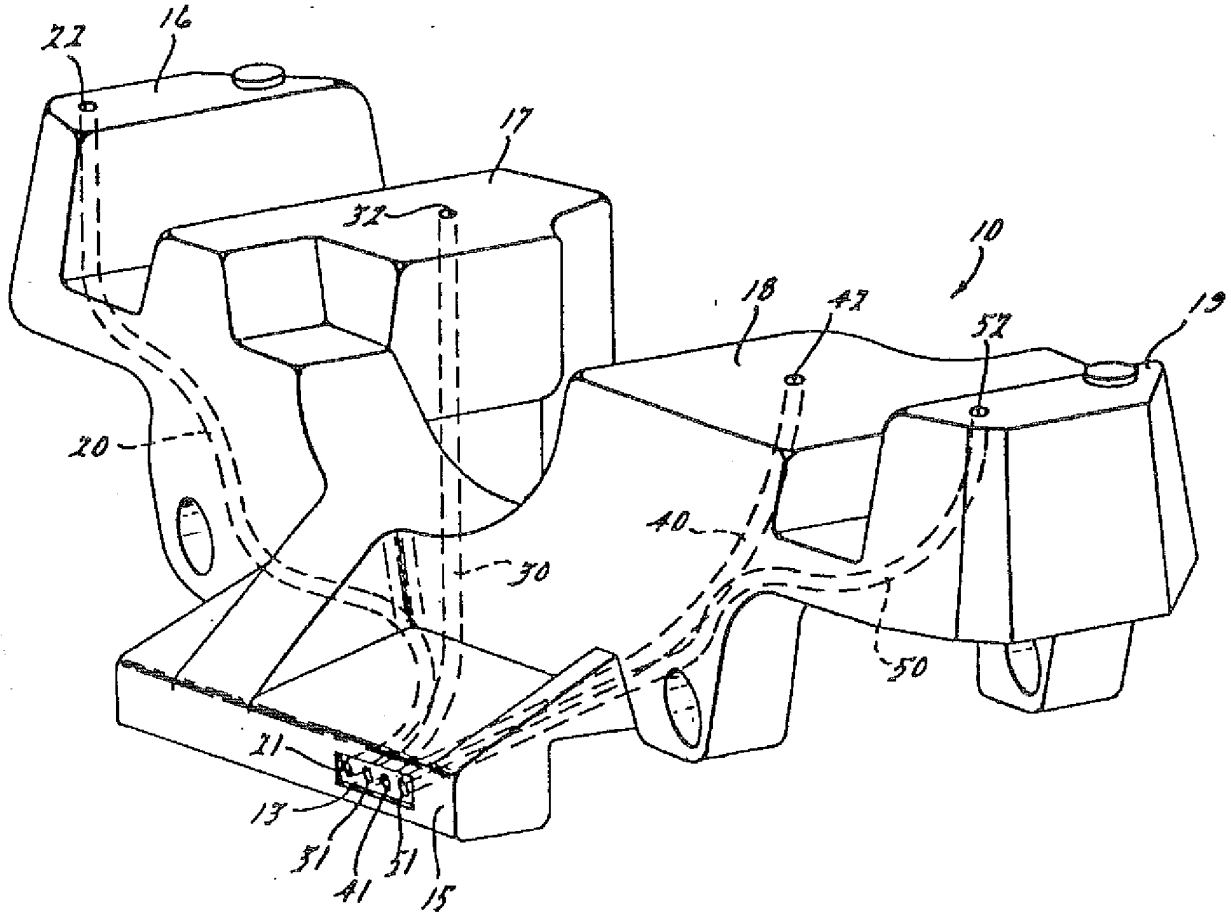


Fig. 5B

[5] The evidence herein was entered in the record by the Examiner in the Advisory Action of August 14, 2007.

(ix) Evidence Appendix (page 2 of 2):

The sole Figure of US 5,045,251 (Johnson)



(x) Related proceeding Appendix:

There are no related proceedings.